STUDIES OF THE ICACINACEAE, III
A REVISION OF EMMOTUM

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With four plates

THE genus *Emmotum* is the largest genus of the New World Icacinaceae. It now includes twelve species and is limited to northern South America, being centered in the Amazon basin. Few of the species are widespread and several are known only from a single mountain.

The genus is easily recognized and is quite distinct among the Icacinaceae. Van Tieghem was so impressed by its characters that he established it as the sole genus of a separate family, the Emmotaceae, allied to the Icacinaceae. The characters upon which he recommended this separation are pronounced; however, such family characters of the Icacinaceae as articulated flowers, valvate aestivation of the corolla, alternate stamens, and two pendent anatropous ovules, of which but one matures, are shared with his segregated unit and it seems preferable to retain it within the Icacinaceae.

Hamilton described *Emmotum* in 1825, crediting it to Desvaux. Miers was the first to recognize that *Pogopetalum,* which Bentham described in 1841, was identical with *Emmotum.* Engler, in 1872, proposed a division of the genus into two sections, which he called *Longistyla* and *Brevistyla.* These groups were based on differences in the petals, stamens, and pistils. Sleumer has accepted this same division, but he established subgenera and substituted the names *Euemmotum* and *Pogopetalum* for Engler's sections. The second section originally contained *E. nitens* (the type selected by Sleumer) and *E. glabrum.* Unfortunately, the latter species does not have the characters of the section and cannot belong there. This error may be traced to an inaccurate plate of Miers. These illustrations are confused and apparently there was an interchange of parts of the two species represented. Isotypes of the species and examination of the original descriptions show this clearly. By removing *E. glabrum* from the subgenus *Pogopetalum* (i.e. the section *Brevistyla* Engler), only *E. nitens* remains. Since the usefulness of this monotypic subgenus is doubtful, it seems advisable to abandon it. The genus *Emmotum* is, accordingly, undivided in this paper.

When van Tieghem proposed the Emmotaceae as a segregated family, he also separated *E. nitens* as a distinct genus, *Pogopetalum.* The characters justifying this newly proposed genus were those previously used by Engler as characters of his section *Brevistyla.* I am treating *Pogopetalum* van Tieghem as a synonym of *Emmotum.*

I am grateful to the directors and curators of the following herbaria for the use of the materials examined in this study: Arnold Arboretum (A), University of California (C), Field Museum of Natural History (FM),

Gray Herbarium (G), New York Botanical Garden (NY), United States National Herbarium (US).

EMMOTUM Desvaux ex Hamilton

Emmotum Desv. ex Hamilton, Prod. Fl. Ind. Occ. 29. 1825; Miers, Ann. Mag. Nat. Hist. II. **9:** 223. 1852, II. **10:** 176. 1852, III. **4:** 366. 1859, Contrib. Bot. **1:** 107. 1851–61; Benth. & Hook. Gen. Pl. **1:** 352. 1862; Baillon, Adansonia **3:** 93. 1863; Engler in Mart. Fl. Bras. **12**(2): 43. 1872; Valeton, Crit. Overz. Olac. 203. 1886; Engler, Nat. Pflanzenfam. **3**(5): 251. 1893; van Tieghem, Bull. Soc. Bot. France **44:** 119. 1897; Sleumer, Notizbl. **15:** 233. 1940.
Emmotum Sect. *Longistyla* Engler in Mart. Fl. Bras. **12**(2): 44. 1872.
Emmotum Sect. *Brevistyla* Engler, l.c.
Emmotum Subg. *Euemmotum* Sleumer, Notizbl. **15:** 233. 1940.
Emmotum Subg. *Pogopetalum* Sleumer, l.c.
Pogopetalum Benth. Trans. Linn. Soc. **18:** 680. 1841, Ann. Mag. Nat. Hist. **7:** 216. 1841.

Flowers perfect, 5-parted; calyx campanulate, fleshy, lobed, persistent; petals valvate, free, fleshy, hirsute, rarely glabrate outside, inside lanate on the raised midrib, the inflexed apex minute, glabrous; stamens free, alternate; anthers ovate-oblong, the thecae two, longitudinally dehiscent extrorsely along the junction with the connective, the connective fleshy, bilobed or cordate at the base, the filament attached basally to the connective or dorsally near the base, glabrous, fleshy, broad and flattened; pistil superior, the ovary globose or dorso-ventrally compressed, glabrous or densely hirsute, frequently with a differentiated fleshy sterile ring of tissue at the base, 2- or 3-loculed; ovules two to each locule, pendent from the apex, anatropous, almost collateral; style terminal or slightly eccentric, glabrous, the apex rounded or slightly 3-lobed; drupe with a thick putamen and one or rarely three fertile cells, one seed to each cell, curved, albuminous, the cotyledons orbicular, the radicle elongate.

Trees, rarely shrubs, the branches pubescent; leaves alternate, petiolate, exstipulate, simple, entire, coriaceous, pinnately and arcuately veined; inflorescence axillary, fascicled, paniculate, bracteate, the flowers articulated.

TYPE SPECIES: *Emmotum fagifolium* Desv. ex Hamilton.

DISTRIBUTION: Brazil, French and British Guiana, Peru, and Venezuela.

The species of *Emmotum* have been reported either as shrubs or as trees up to 45 feet in height and with trunk diameters of 8–12 inches. They grow in a variety of habitats, from sandy coastal plains to high mountains, but are predominately trees of undisturbed forests which are not flooded. Several species have been reported at 5000 feet altitude. The mature wood is available for study from only one species and the anatomy of the stem has been considered in another series of papers (Bailey and Howard, Jour. Arnold Arb. **22:** 129, 171–187, 432–442, 556–568. 1941).

The thick coriaceous leaves have the midrib and veins sulcate above and usually prominent below. The veins are either straight and parallel for most of their length, or are arcuate for their full length. The ends of the veins approach the margin of the leaf and remain free. Only in *E. conjunctum* do the tips anastomose noticeably. The texture of the leaf is thick and firm and the veinlets are obscure. Between the veins are minute trans-

verse ridges caused by the underlying fibers. Van Tieghem mentions these peculiar and quite numerous characteristic fibers, which surround the meristeles and the veinlets. Their walls are spirally thickened and the fibers add noticeably to the strength and consistency of the lamina.

The leaf-blade is usually densely pilose or tomentose on both surfaces when young and becomes glabrate and shining above. The pubescence on the lower leaf-surface may persist or may be lost very early. These thick-walled hairs are articulated to relatively large thin-walled bases. The bases are lighter in color than the rest of the epidermal cells and are quite noticeable in the older leaves. These are the structures to which, I believe, Miers applies the term glands. The pubescence in *Emmotum* frequently is a rich golden or brown color. In some instances the pubescence will lose its color and become silvery or gray as the leaf matures. In other species, however, there is no indication of this color change and the older leaves have a pubescence of the same color as the younger ones. A similar pubescence may be found on the young branches, the inflorescence, and the outside of the perianth. In many species the leaf-blade has, in addition to a colored pubescence, pigmentation in the cells. This pigmentation may also pervade the tissues of the bark and wood, the calyx and corolla, the filament and connective, and frequently the tissues of the ovary and the fruit. It appears to be similar to that also found in *Poraqueiba* and *Ottoschulzia*. It is removed by boiling in water and comes out very rapidly in hot caustic soda. Not all of the cells of the tissues contain this pigment, but some cells are very full of it.

The axillary inflorescences found in *Emmotum* are composed of 3–8 panicles. They are usually shorter than the petioles and are few-flowered. Axillary inflorescences are also found in many other New World genera, but in none are they so compact, clustered, pubescent, and bracteate. The pedicels are short and bear several ovate bracts. Usually one of these is at the apex of the pedicel and subtends the articulation of the flower. As many authors have noted, the open flowers bear a striking resemblance to *Ximenia* of the Olacaceae.

The calyx is fleshy, with the lobes usually well developed. It enlarges only slightly, if at all, in fruit. The corolla is typical of the family, having hypogynous free petals with a minute inflexed apex. The midrib of the petal is fleshy and well developed into a ridge, which bears a dense red-brown wool usually covering at least the upper two-thirds of the midrib. The one exception to this is found in *E. nitens*, which has the fleshy midrib but has only two clusters of hairs, one near the base and the other at the apex. In all cases the remainder of the inner face of the petal is glabrous, as the pubescence is limited to the midrib. Miers reports that the pubescence bears small glands. I have found none. The hairs when dry are rugose or warty and may even appear as a string of beads, and frequently these irregularities disappear upon swelling in caustic soda. Various collectors report the petals as white, cream, or tawny in color. They are reflexed at maturity and fall very early.

The stamens are extrorse, a condition rarely found in the family. Bentham

reported an introrse dehiscence for *Pogopetalum;* however, he illustrates an extrorse dehiscence in his accompanying plate. The thecae of the anthers are reduced to two. Van Tieghem compares them with the interior pair of a normal tetrathecal anther. The dehiscence is longitudinal, however, and takes place along the junction with the connective. Similar dehiscence is found in *Poraqueiba* and *Oecopetalum*. The attachment of the anther with the filament is either basal or dorsal. In some specimens the filament may arch abaxially to the anther; however, this is not conspicuous. The filament is fleshy and flattened. It is frequently reported as fused with the petals, but, at best, this fusion is only weak. The filament curves outward at anthesis.

Usually the ovary in this genus has three locules; however, this number may be reduced to a single one. *Emmotum glabrum* consistently has only two locules. In the family the plural locular condition is not limited to *Emmotum*. It is relatively common in *Citronella* and it has been reported in *Pennantia*. The three locules are eccentrically placed, thereby giving the impression that they represent the remainder of a former 5-loculed ovary. Each locule has two anatropous ovules which are pendent from the apex of the cavity. They are not exactly superposed nor are they collateral, usually having some intermediate position. Only one ovule matures. The style is either terminal or eccentric. When it is terminal the vascular traces are in the axis of the three locules, that is, eccentric. However, the more common condition is a strongly eccentric style. Previous workers have referred to a disk in the flowers of this genus. This term they applied to the ovary-wall, which is fleshy, glabrous or pubescent, and slightly swollen. A section cut through this region shows that the tissue of this sterile area is lighter in color in that it lacks the pigmented cells present elsewhere. In no sense does this tissue seem to be an expansion of the torus or the receptacle. It is not free from the ovary, and both this area and the upper portion of the ovary are covered with a thick epidermis which bears the indument. It seems to be a misapplication of the term to call this area a disk, and it might better be considered simply a differentiated basal sterile ring of ovarian tissue.

The mature drupe may have one to several cells. I have not seen any specimens which have developed seeds. Other workers, however, have reported from one to three locules in the mature fruit with one seed in each. The seed is reported as curved, albuminous as in the rest of the family, with a curved embryo, an elongated radicle, and orbicular cotyledons. The putamen of these fruits is relatively thicker than that of any other New World genus. The outer surface is sharply but irregularly ornamented or dissected, while the inner surface of the locule is smooth.

The relationships of this genus appear to be with *Poraqueiba, Oecopetalum,* and possibly with *Ottoschulzia*.

KEY TO THE SPECIES

Style shorter than the ovary or scarcely equalling it; anther-sacs folded inward, the anther basally attached to the filament.

Petals with two distinct clusters of hairs on the midrib; anther as long as or longer than the filament, the connective extended beyond the incurved thecae; style noticeably eccentric; leaves pubescent below at maturity, the lateral veins evident.

Leaves ovate-orbicular.....1. *E. nitens.*

Leaves lanceolate.....1a. *E. nitens var. angustifolium.*

Petals with a continuous lanate pubescence on the midrib; anther shorter than the filament, the connective not exceeding the incurved thecae; style essentially terminal; leaves glabrous at maturity, the lateral veins obsolete..2. *E. argenteum.*

Style at least twice the length of the ovary; anther-sacs usually flat.

Ovary glabrous.

Leaves orbicular, the apex rounded, with a short cusp.....3. *E. nudum.*

Leaves ovate, the apex acuminate.

Mature leaves glabrous below, the lateral veins 6 or 7 pairs; petioles short, 1–1.4 cm. long; petals 3.5–4.0 mm. long; stamens 3–3.5 mm. long, the anthers ovate.....4. *E. acuminatum.*

Mature leaves densely tawny pubescent below, the lateral veins 10 or 11 pairs; petioles 1.5–2.0 cm. long; petals 6–6.5 mm. long; stamens 5.5 mm. long, the anthers ovate-oblong.....5. *E. floribundum.*

Ovary hirsute.

Exterior of perianth almost glabrous; ovary two-celled; sepals pubescent only at the tips; petals sparsely pubescent outside on a median line; anther-sacs folded inward, the anther attached basally to the filament; leaves glabrous at maturity.....6. *E. glabrum.*

Exterior of perianth densely pubescent; ovary three-celled; sepals and petals evenly pubescent outside; anther-sacs flat, the anther attached dorsally above the base; leaves pubescent or becoming glabrate.

Leaves ovate to orbicular.

Leaves orbicular, the apex obtuse, the lateral veins 6 pairs...7. *E. orbiculatum.*

Leaves ovate, the apex acute or acuminate.

Leaves densely fulvo-sericeous below, the veins 11 pairs, the lamina 10–22 cm. long, 8–13 cm. broad.....8. *E. holosericeum.*

Leaves short and conspicuously hirsute below, smaller, the lateral veins 6–8 pairs, the lamina 8–12 cm. long, 4–7 cm. broad.....9. *E. affine.*

Leaves oblong or elliptic.

Veins obsolete.....2. *E. argenteum.*

Veins prominent.

Lateral veins 12 or 13 pairs, pinnate, parallel, conspicuously anastomosing at the margins, the lamina bicolorous.....10. *E. conjunctum.*

Lateral veins 7–9 pairs, arcuate, free at the margin, the lamina concolorous.

Pistil with a differentiated sterile glabrous area conspicuously developed at the base; plant silky-white-short-pilose or sericeous; petioles slender.....11. *E. fagifolium.*

Pistil without the differentiated area conspicuously developed at the base; ovary pubescent almost to the base; plant densely golden-brown-hirsute; petioles stout.....12. *E. fulvum.*

1. **Emmotum nitens** (Benth.) Miers, Ann. Mag. Nat. Hist. II. **10:** 180. 1852.

Pogopetalum nitens Benth. in Hook. Lond. Jour. Bot. **2:** 377. 1843.

Siagonanthus sericeus Pohl ex Engler in Mart. Fl. Bras. **12**(2): 46, as synonym. 1872.

Tree, the branches striate, angular, densely short-gray-pubescent; petioles 1–2 cm. long, deeply but narrowly sulcate above, densely gray-pubescent; lamina oblong, 7–14 cm. long, 4–8 cm. broad, coriaceous, glabrous, shining above, densely gray- or brown-short-pilose or sericeous below, the apex acuminate or acute, the base rounded, the margin slightly revolute, the midrib sulcate above, prominent below, the lateral veins 6 or 7 pairs,

inconspicuous above, arcuate, free at the ends; panicles 3 or 4, fascicled, 1–1.3 cm. long, densely yellow- or brown-short-pubescent; bracts ovate, acuminate at the apex, densely pubescent; calyx 2 mm. in diameter, fleshy, densely pubescent, the lobes 0.5 mm. high, obtuse, rarely acute; petals lanceolate or broadly lanceolate, 3–4 mm. long, 1–1.3 mm. broad, acute at the apex, densely strigose or hirsute, white- or golden-brown-pubescent outside, inside bearing two large clusters of lanate hairs, one at the base and the other near the apex of the fleshy raised midrib, the rest of the petal glabrous, the inflexed apex short, glabrous or rarely minutely papillate; stamens 2.8–3.2 mm. long, the anthers attached basally, 1.5–1.8 mm. long, the thecae incurved, the connective oblong, fleshy, curved, extending beyond the thecae to an obtuse or rounded apex, the filament shorter than the anthers at anthesis; pistil shorter than the stamens, 1–1.5 mm. high at anthesis; ovary globose, densely short-gray- or golden-brown-pilose, the base differentiated into a fleshy glabrous sterile area, the ovary three-celled; style eccentric, much shorter than the ovary, glabrous, minutely three-lobed at the apex; drupe depressed-globose, 1–1.5 cm. in diameter, 1–1.2 cm. high, sparingly pilose, becoming glabrate, the putamen extremely thick, rugose or sculptured outside, the three locules each one-seeded.

TYPE COLLECTION: *Gardner 3309*, from Pernambuco, Brazil.

ILLUSTRATIONS: Miers, Contrib. Bot. **1**: *t. 22.* 1851–61; Mart. Fl. Bras. **12**(2): *t. 9.* 1872; Nat. Pflanzenfam. **3**(5): *fig. 139, M–O.* 1893.

DISTRIBUTION: Brazil (Pernambuco, Matto Grosso, Minas Geraes, Goyaz, Bahia).

BRAZIL. Matto Grosso: Santa Clara de Chapada, *Malme 1470* (G). Minas Geraes: Paracatu, *Glaziou s.n.* (NY); Corinto, Corriga diamente, alt. 590 m., *Mexia 5591* (FM, G, NY, US). Goyaz: *Gardner 3309* (FM, G, NY, ISOTYPES); *Burchell 9233* (G). Bahia: Serra de Açurua, Rio S. Francisco, *Blanchet 2889* (FM, NY). Without locality: *Herb. Hook. 1105* (G); *Pohl s.n.* (FM), *1935* (G), *1936* (G).

Both Glaziou and Mexia report this plant to be a large tree. The plant in dried condition may have either a golden-brown or a gray to silky-white pubescence on all parts, particularly on the under side of the leaves. The upper leaf-surface is commonly shining and usually is a dark purple when dry. Frequently two bracts are found immediately below the calyx, surmounting the pedicels. The separated clusters of hairs on the inside of the petals are very different from anything else found in the genus. The noticeable incurving of the anther-sacs and the obtuse incurved projecting tip of the connective characterize the anthers of this species. The basal attachment of the anther to the filament is found only in this species and *E. glabrum*. A belt of dark stained cells is commonly present in the middle of the filament. The stamens do not recurve in *E. nitens* at anthesis, as they do in the rest of the species, but remain arched over the pistil. The short style is the initial character of Engler's section *Brevistyla* and has a counterpart only in *E. argenteum*. This species was indicated as the type of van Tieghem's genus *Pogopetalum*.

Miers seems to have made an error in the plates of *E. nitens* in Contrib. Bot. **1**: *pl. 22.* The petals as drawn on *E. nitens* probably belong with *E. glabrum*. I have examined isotypes of numbers cited by Miers and find that the specimens do not agree with his plates. Engler in Nat. Pflanzen-

fam. has redrawn the petals of *E. nitens* and has correctly shown the separation of the clusters of hairs on the inside of the petals.

Bentham's original description indicates the ovary as glabrous. Examination of cited material shows that this also must have been an error.

1a. **Emmotum nitens** (Benth.) Miers, var. **angustifolium** Engler in Mart. Fl. Bras. **12**(2): 46. 1872.

Schnizleinia nitida Mart. ex Engler, l.c., as synonym.

Leaves narrow, lanceolate; panicles few-flowered, equal in length to the petiole.

ILLUSTRATION: Mart. Fl. Bras. **12**(2): *t. 9. fig. 2.* 1872.

I have seen no specimens referable to this variety, but Engler's plate shows well the varietal differences described.

2. **Emmotum argenteum** Gleason, Bull. Torrey Bot. Club **58:** 385. 1931.

Small slender shrub, the branches terete, densely sericeous when young, becoming glabrate; petioles short, 5–7 mm. long, densely sericeous, broadly sulcate above; lamina oblong, 7–10 cm. long, 3.5–4.5 cm. broad, coriaceous, red-brown in color, the apex abruptly acuminate to a sharp cusp 10–14 mm. long, the base rounded, the margin flat, the young leaves densely silvery-sericeous on both sides, becoming glabrate except on the midrib above and below, the midrib prominent below, the veins weakly developed or obsolete, the veinlets scarcely visible; inflorescence few-flowered, densely sericeous; bracts ovate; calyx 2 mm. in diameter, 2 mm. high, the lobes ovate, acute, 0.9–1.2 mm. long, 0.8 mm. broad, sericeous outside, inside weakly villose or lanate; stamens 2.0–2.8 mm. long, the anthers ovate, 0.8–0.9 mm. long, separate at the base, the thecae recurved, the connective fleshy, not exceeding the anther-sacs, the filaments attached at the base of the connective, fleshy, broadest near the apex; ovary globose, 1–1.4 mm. in diameter, 2- or rarely 3-celled, densely long-white-hirsute to the base, with no sterile area conspicuously differentiated; style straight, 0.6–0.8 mm. long, terminal, glabrous, 3-toothed at the apex; fruit unknown.

TYPE COLLECTION: *Tate 564* (NY), collected in Amazonas, Venezuela, on Mt. Duida.

Emmotum argenteum was collected at an altitude of 4800 feet. It is a distinct species and may be readily recognized through its dense pubescence on the younger parts, the practically obsolete and inconspicuous lateral veins of the subglabrous mature leaves, the fleshy filaments, and the two-celled ovary. The two-celled ovary has a terminal style, and these two conditions are found elsewhere in the genus only in *E. glabrum,* which also has the inconspicuously veined leaves but has a different leaf-shape. The relationship of this species is, more correctly, with *E. glabrum*. I have not seen any evidence of the 3-celled ovary reported in the original description.

3. **Emmotum nudum** sp. nov.

Emmotum orbiculatum sensu Engler in Mart. Fl. Bras. **12**(2): 45. 1872; not Miers.

Arbor amazonica; ramulis cinereis; petiolis 9–18 mm. longis crassis profunde sulcatis breviter cinereo-pubescentibus; laminis orbiculatis, 9.5–13 cm. longis, 7–9 cm. latis, supra glabris nitidis nervo medio sulcato notatis, subtus dense sericeo-pilosis nervum medium prominentem et nervos laterales subprominentes 7-arcuatos ad apicem liberos gerentibus, apice rotundatis aut obtusis mucronatis, basi rotundatis; calyce campanulato, 2 mm. dia-

metro, 1.5 mm. alto, sericeo-piloso, lobis triangularibus, 0.5 mm. longis, 0.7 mm. latis, obtusis; petalis ovatis vel lanceolatis, 4.7 mm. longis, 1–1.2 mm. latis, latere interiore carinam rufo-lanatam proferentibus, latere exteriore sericeis; staminibus 3–4 mm. longis, antheris ovato-oblongis 1–1.1 mm. longis, thecis planis; ovario globoso 1 mm. diametro glabro 3-loculato; stylo eccentrico 2 mm. longo glabro; fructu drupaceo globoso, 1.2 cm. longo, 1.0 cm. lato, 0.4 cm. alto.

ILLUSTRATION: Plate 1.

BRAZIL. Pará: Faro, "in campis arenons loco Tigre," Dec. 31, 1929, *Ducke 11367* (US 1473378, TYPE); campos a l'est de Faro, *Ducke 8707* (US). Amazonas: Rio Negro, above the opening of the Casiquiari, *Spruce 3541* (FM, photo, G, NY).

This plant is distinct in its orbicular leaves and glabrous pistil. The flowers are white and odorous, according to Ducke. The fruit is 3-celled, with apparently only one seed developing in each cell; however, all the seeds are aborted in the fruits I have available for study. The mature fruits are prominently three-lobed. A section through the sclerified putamen shows several cavitites present other than the three ovuliferous locules. The locules are oblong in section, eccentric, smooth inside and regular in outline. There are two smaller cavities between these locules and two larger cavities, circular in section, outside of the lateral locules. These four cavities are irregular in shape and very rough on the inner surface. They are empty in all the specimens I have seen. While two of them are larger in section than are the ovuliferous locules, none of them have the vertical extension of the locules. These cavities do not appear to be developed at the flowering stage.

Pogopetalum orbiculatum was described by Bentham and was based on a Schomburgk collection from the Padawire river, Amazonas, Brazil. Bentham definitely notes the hirsute or pilose nature of the pistil. Nevertheless Engler has referred a Spruce collection (*3541*) with strictly glabrous pistils to this species. I regard the Spruce specimen as specifically distinct and have placed it with *Emmotum nudum*. While the collections cited by Engler appear similar in leaf-form, the strictly glabrous nature of the pistil in *Emmotum nudum* suggests that a different species is represented.

It might be noted here that the specimens collected by Ducke called "*E. orbiculatum*" and later referred to *E. acuminatum* (Arch. Inst. Biol. Veg. Rio **4:** 45. 1938) are representatives of the present species.

4. **Emmotum acuminatum** (Benth.) Miers, Ann. Mag. Nat. Hist. II. **10:** 178. 1852, Contrib. Bot. **1:** 108. 1851–61.

Pogopetalum acuminatum Benth. Trans. Linn. Soc. **18:** 685. 1841, Lond. Jour. Bot. **2:** 377. 1843.

Medium-sized tree, the branches terete, slightly striate, sparsely puberulent, soon becoming glabrate; petioles 1.3–2.0 cm. long, sulcate above, puberulent when young, becoming glabrate; lamina ovate-oblong to oblong, 8–15 cm. long, 5–8 cm. broad, glabrous, shining above, usually darkening on drying, appressed-hirsute or pilose when young, becoming glabrate except on the veins and midrib, the midrib sulcate above, prominent below, the lateral veins 6 or 7 pairs, arcuate, free at the ends, the veinlets inconspicuous, the apex narrowly long-acuminate to a mucronate point 1–2 cm. long, the base rounded, the margin slightly revolute; inflorescence about equal to

the petiole in length, densely short-sericeous; calyx campanulate, 1.5 mm. in diameter, 1 mm. high, the lobes broadly triangular, 0.2–0.3 mm. high, nearly obtuse, densely short- and finely sericeous; petals oblong-lanceolate, 3.5–4.6 mm. long, 1.1–1.3 mm. broad, lightly sericeous outside, red-lanate inside; stamens 3.1–4 mm. long, the anthers oblong-ovate, 1–1.2 mm. long, the thecae flat, equidistant at both ends, the connective oblong, rounded at the base and apex, attached to the filament dorsally near the base, the filament broadest at the base; pistil glabrous, 3.5 mm. high at anthesis, the ovary globose, 1 mm. in diameter at anthesis, with a conspicuous differentiated area at the base, 3-loculed, the style eccentric, 2.3 mm. long, the apex rounded; drupe 1.5 cm. diameter, depressed-globose.

TYPE COLLECTION: *Schomburgk 970,* collected on the Kukenam River, Amazonas, Brazil.

ILLUSTRATION: Miers, Contrib. Bot. **1:** *t. 21.* 1851–61.

BRAZIL. Amazonas: Kukenam River, *Schomburgk 970* (FM, G, US, ISOTYPES); Manáos, near Cochaeira, *Ducke 376* (A, FM, NY, US); Rio Negro, between Barcellos and Sta. Izabel, *Spruce 1989* (photos FM, G).

The Schomburgk specimens bear labels citing the country of origin as British Guiana. In his Fauna and Flora of British-Guiana, page 1095, Richard Schomburgk reports *Pogopetalum acuminatum* from the banks of the Kukenam, and according to Roth's translation of Schomburgk's Travels in British Guiana 1840–44 (Vol. 2, map facing page 176), this river is one of the headwaters of the Caroni. Careful checking shows that this collection was made in Brazil near the boundaries of Venezuela and British Guiana. Bentham, in his original description of the species, cites the Schomburgk collection as from the banks of the Rio Negro.

Emmotum acuminatum can easily be recognized by its glabrous pistil and ovate long-acuminate leaves. I have not seen the fruits of this species, and my description of the drupe is taken from earlier descriptions. *Emmotum acuminatum* is a tree to 30 feet tall, with pure white flowers.

5. **Emmotum floribundum** sp. nov.

Arbor parva; ramis subteretibus cinereo-pubescentibus mox glabrescentibus; petiolis tenuibus 1.5–2 cm. longis anguste sulcatis cinereo-pubescentibus; laminis ovatis vel oblongis, 9–12 cm. longis, 4.5–5 cm. latis, supra nitidis glabris castaneis, subtus breviter et adpresse castaneo-hirsutis, nervos laterales 10 subprominentes arcuatos ad apicem liberos gerentibus, apice acutis, basi rotundatis; paniculis 3 vel 4 fasciculatis breviter fusco-sericeis; calyce campanulato, 2 mm. diametro, 1.3 mm. alto, sericeo, lobis triangularibus, 0.6 mm. longis, 0.7–0.8 mm. latis; petalis lanceolato-ovatis vel lanceolatis, 6–6.3 mm. longis, 1.5 mm. latis, extus dense cano-sericeis, intus secus costam castaneo- aut rufo-lanatis; staminibus 5.5–6 mm. longis incurvis, antheris ovato-oblongis 1.2 mm. longis, thecis planis, filamentis planis 0.7 mm. latis basim versus dilatatis; ovario globoso glabro 1 mm. diametro 3-loculato; stylo eccentrico 4 mm. longo glabro; fructu ignoto.

ILLUSTRATION: Plate 2.

PERU. Loreto: Mishuyacu, near Iquitos, alt. 100 m., forest, April 1930, *Klug 1212* (FM, TYPE).

VERNACULAR NAME: *Ingaina.*

Klug reports this to be a tree 40 feet tall, with cream-colored flowers. It is distinct from the other species of *Emmotum* in having a broader inflorescence with large flowers, a glabrous pistil, and ovate leaves with more numerous veins. Only *E. glabrum* has been reported previously from Peru. The present species is closest to *E. acuminatum*.

6. **Emmotum glabrum** Benth. ex Miers, Ann. Mag. Nat. Hist. III. **4**: 366. 1859, Contrib. Bot. **1**: 230. 1851–61.

Tree, the branches slender, terete, short-cinerous-pubescent; petioles short, 7–9 mm. long, slender, dorsally canaliculate above with the margins flaring, almost winged, sparsely short-crispose or hirsute-pubescent; lamina ovate to elliptic, 6–9 cm. long, 3.5–4.5 cm. broad, the upper surface glabrous, dull, rarely shining, the lower surface lighter, short-hirsute when young, soon becoming glabrate, ferrugineous when dry, the apex long and narrowly attenuate to a mucronate point 1–1.5 cm. long, the base rounded, the margin flat or slightly revolute, the midrib sulcate above, prominently developed below, the veins almost inconspicuous on both sides, weakly and irregularly arcuate, free at the ends; inflorescence few-flowered, the panicles slender, slightly exceeding the petioles or to 1.5 cm. long, sericeous; calyx campanulate, 2 mm. in diameter, 1 mm. high, the lobes ovate, 0.6–0.7 mm. high, rounded or acute at apex, glabrous but for a ciliated apex or cluster of pilose hairs on the tip; petals ovate-lanceolate, 3.0–3.6 mm. long, 0.7–1.0 mm. broad, glabrous outside but for a median row of short pilose hairs, inside densely red-brown-lanate on the midrib; stamens 3–3.6 mm. long, incurved, the anthers ovate-oblong, 1–1.2 mm. long, the thecae incurved, slightly separate at the base, the filaments broadest at the base; pistil 2.6–3.0 mm. high, the ovary globose, densely silky-hirsute, 1 mm. diameter at anthesis, with a differentiated sterile and pubescent base, 2-loculed; style eccentric, glabrous, 1.4–2.0 mm. long, the apex 3-toothed or rounded; fruit unknown.

TYPE COLLECTION: *Spruce 3536*, collected on the Rio Negro, Amazonas, Brazil.

ILLUSTRATION: Miers, Contrib. Bot. **1**: *t. 22*. 1851–61, as to habit only.

BRAZIL. Amazonas: Rio Negro, *Spruce 3536* (FM, G, NY, ISOTYPES). PERU. San Martín: Chazuta, on Río Huallaga, alt. 200 m., *Klug 3990* (FM, G, NY).

The collection by Klug from Peru is only slightly different from that of Spruce. Klug's collection bears an unpublished herbarium name derived from the country of origin. This Peruvian material differs from the Spruce collection in having the inflorescence shorter than the petioles, the sterile base of the ovary essentially glabrous or with only a few hairs, and the locules abutting on the narrow ends instead of lying parallel for their length. While these differences seem consistent, I do not consider them of sufficient importance to merit specific distinction, even though the two collections were obtained some distance from one another.

I have examined duplicates of the collection cited by Miers and Engler and do not agree with certain details of their descriptions of this species. Neither author indicates the presence of some pubescence on the outside of the corolla. The corolla is sparsely pubescent rather than glabrous. The figure given by Miers is inaccurate, apparently representing some parts of materials derived from *E. nitens*, as was mentioned earlier. Miers illus-

trates separate clusters of hairs on the petals, which are characteristic of *E. nitens* and not of *E. glabrum*. He figures an extension of the connective beyond the anther-sacs, and Engler describes the same. I have seen no indication of this development in the isotypes of *E. glabrum*. Curiously Miers also illustrates a pubescent calyx, but in this case he makes no mention of this character in his description. His habit sketch of the plant, however, is a good representation of the present species.

Klug reports the plant to be a tree 25 feet tall, with cream flowers.

7. **Emmotum orbiculatum** (Benth.) Miers, Ann. Mag. Nat. Hist. II. **10:** 178. 1852, Contrib. Bot. **1:** 108. 1851–61.

Pogopetalum orbiculatum Benth. Trans. Linn. Soc. **18:** 685. 1841, Lond. Jour. Bot. **2:** 377. 1843.

Tree, the branches spreading, cinerous- to fulvo-tomentose; petioles stout, 1.2–1.5 cm. long, deeply sulcate; lamina ovate-orbicular, 7–8.5 cm. long, 6.5 cm. broad, glabrous and shining above except in the sulcate midrib, fulvo-tomentose below, the apex obtuse or slightly mucronate, the base rounded, the margin slightly revolute, the midrib sulcate, the lateral veins 6 pairs, parallel, arcuate toward the margin, free at the ends; inflorescence to 2 cm. long; calyx puberulent, the lobes ovate; petals ovate, 4 mm. long, pubescent outside, barbate or lanate inside; stamens shorter than the petals, the anthers oblong-ovate, the thecae approximate at the apex, slightly separated at the base; ovary globose, hispid, 3-loculed; style eccentric, glabrous; drupe depressed-globose, 1-celled.

ILLUSTRATION: Benth. Trans. Linn. Soc. **18:** *t. 42.* 1841.

This species is based on a Schomburgk specimen from the Padawire (Padauiry) River, a northern tributary of the Rio Negro in Amazonas, Brazil. In his Fauna and Flora of British Guiana, Richard Schomburgk reports the collections as from the "vicinity of Roraima." I have seen no authentic material nor specimens referable to this species. In Bentham's original plate the ovary is clearly figured as pubescent and described in the text as hispid. Engler (in Mart. Fl. Bras. **12**(*2*)**:** 45. 1872) referred a Spruce collection here and emended the description of Bentham to describe a glabrous ovary. Since throughout the genus the presence or absence of pubescence seems to be a good specific character, it is probable that Engler improperly included more than one species in his concept of *E. orbiculatum*. The glabrous form which was included by Engler in Bentham's species I have segregated as *E. nudum*. The true *E. orbiculatum* may be recognized by the hispid ovary. The orbicular leaves are almost unique in the genus.

When Miers treated *E. orbiculatum*, he cited a specimen collected on the Rio Preto in Pernambuco by Gardner (*2941*) as referable to this species. However he also cited the same number under *E. nitens*. The same collection was previously cited by Bentham in the original description of *E. nitens*. Engler refers *E. orbiculatum* to both Pernambuco and Brazilian Guiana on the basis of the Gardner specimen. While I have not seen this material, it is evident that Miers made an error and that the Gardner material belongs in *E. nitens*. *E. orbiculatum* is apparently known only from the original collection.

8. **Emmotum holosericeum** Ducke, Arch. Inst. Biol. Veg. Rio **4:** 45. 1938.

Tree, the branches terete, longitudinally striate, densely red-brown-tomentose when young, becoming glabrate; petioles stout, 2–3 cm. long, strongly sulcate above, longitudinally ridged, densely brown-tomentose; lamina ovate to broadly elliptic-ovate, 10–22 cm. long, 8–13 cm. broad, densely golden-brown-tomentose above when young, becoming glabrate and shining except in the sulca of the midrib, below densely golden- or brownish-sericeous-pilose, not becoming glabrate, the midrib deeply sulcate above, prominent below, densely pubescent, the lateral veins 10–12 pairs, sulcate above, conspicuous below, parallel, arcuate only near the margins, free at the ends, the apex acute, rarely acuminate or obtuse, the base rounded, the margin revolute; panicle 2–4.5 cm. long in fruit, stout, densely pubescent; flowers not known; drupe depressed-globose, sparsely short-pilose, 2.0 cm. in diameter, the mesocarp thin, fleshy, the putamen woody, 2.3 mm. thick, the locules three, evenly developed and regularly spaced, the seeds one in each locule.

TYPE COLLECTION: *Ducke 35548*, from Borba, Rio Madeira, Amazonas, Brazil.

BRAZIL: Amazonas: Borba, Rio Madeira, April 7, 1936, *Ducke 35548* (US, ISOTYPE), *Ducke 289* (NY).

Careful examination of the mature fruit of this species shows the presence of a few scattered hairs. It is assumed, therefore, that the pistil was likewise pubescent and that the affinities of this species must be with *E. orbiculatum* and *E. fagifolium* rather than with *E. acuminatum*.

These plants are readily identified by the beautiful dense golden-sericeous pubescence on the lower side of the leaf. This is found in an unreduced state in the oldest leaves on the sheets that I have seen. This is the only species of the genus for which I have seen mature wood specimens. Wood specimens are available at the Yale School of Forestry and microscope slides of the same in the Harvard wood collection.

It may be necessary to reconsider this species when more is known about *E. orbiculatum*. At present, *E. holosericeum* may be distinguished by its larger leaves, more numerous veins, and the striking golden-brown pubescence.

9. **Emmotum affine** Miers, Ann. Mag. Nat. Hist. II. **10:** 180. 1852, Contrib. Bot. **1:** 110. 1851–61.

Pogopetalum affine Planch. ex Miers, l.c.

Tree, the branches terete, the younger branches short-brown-strigose or hirsute-pubescent, becoming glabrate; petioles slender, 1–2 cm. long, narrowly sulcate above, short-brown-pubescent, becoming glabrate; lamina ovate, 8–12 cm. long, 4–7 cm. broad, hirsute above, becoming glabrate except near the base and in the sulca of the midrib, shining at maturity, densely short-brown-appressed-hirsute below, becoming glabrate, the midrib sulcate above and prominent below, the lateral veins 6–8 pairs, slightly sulcate, arcuate, free at the ends, the apex acute or attenuate, occasionally with a short mucro, the base rounded, the margin revolute; panicles 3 or 4, shorter than or equalling the petioles, densely brown-sericeous or strigose; calyx 2–3 mm. in diameter, deeply lobed, densely brown-sericeous, the lobes ovate, obtuse or acute at the apex, 1 mm. long; petals ovate-lanceolate, 4.5 mm. long, 1.5–1.7 mm. broad at maturity, densely sericeous or pilose

outside, inside red-brown-lanate; stamens 4–4.5 mm. long, the anthers ovate-oblong, 1–1.7 mm. long, the thecae flat or slightly recurved at the tip, approximate at the apex, frequently widely separated at the base, the connective fleshy, oblong, obtuse or rounded at the apex, rounded or cordate at the base, attached to the filament dorsally near the base; ovary globose, 1.2 mm. in diameter at anthesis, densely hirsute above, with a sterile glabrous area differentiated at the base, 3-loculed; styles 2.5–2.6 mm. long, glabrous, terminal or slightly eccentric, the apex rounded or slightly 3-lobed; fruit unknown.

TYPE COLLECTION: *Sellow* (Hook. Herb., not seen), from Brazil.

BRAZIL. Bahia: *Blanchet 1702* (FM, NY). Pernambuco: Prozeres, sandy soil of littoral zone, *Pickel 3125* (FM, G); Oct. 1930, *Pickel s.n.* (FM, G).

I have seen no authentic material of this species. I have been unable to find any other reference than Miers' to the Sellow specimen in literature and cannot determine in what state of Brazil it was collected.

Engler (in Mart. Fl. Bras. **12**(2): 45. 1872) referred this species with question to the synonymy of *E. acuminatum*. This latter species, however, has a glabrous ovary, ovate leaves with long acuminate apices which do not recurve, and is found in British Guiana and Amazonas, Brazil. *E. affine* has a pilose or hirsute ovary, smaller ovate leaves, which are acute or tapering at the apex or rarely with a short mucro, and the apex is usually curved downward as Miers mentions. Engler (l. c.) has referred the Blanchet specimen (*1702*) to *E. fagifolium;* however, in all its characters it is in agreement with *E. affine*.

10. **Emmotum conjunctum** sp. nov.

Arbor; ramulis subangulatis cinereo-pubescentibus; petiolis subteretibus 1–1.3 cm. longis sulcatis; laminis oblongis vel ellipticis, 7–8 cm. longis, 2.5–3.5 cm. latis, supra nitidis glabris nervo medio sulcato notatis, subtus pallidis breviter sericeis, nervis lateralibus 12 vel 13 subprominentibus pinnatis parallelibus marginem versus arcuatis anastomosantibus, apice acutis cum mucroni 5–9 mm. longo deflexo ornatis, basi rotundatis, margine revolutis; paniculis 5–7 fasciculatis brevibus 4–10 mm. longis breviter sericeis; calyce campanulato sericeo 2 mm. diametro, lobis ovatis 1 mm. altis; petalis lanceolato-oblongis, 6–6.3 mm. longis, 2 mm. latis, extus dense sericeis, intus cum costa rufo-lanata instructis; staminibus 5–5.4 mm. longis, antheris ovato-oblongis 1.5–1.8 mm. longis, thecis planis, filamentis crassulis 1 mm. latis; ovario globoso 3-loculato 1 mm. diametro, sub anthesi 1–1.3 mm. longo, supra dense hirsuto, ad basim glabro; stylo subterminali 3.6–4.0 mm. longo glabro; fructu ignoto.

ILLUSTRATION: Plate 3.

VENEZUELA. Amazonas: Mt. Auyan-Tepui, alt. 1100 m., Dec.–Jan. 1937–38, *Tate 1354* (US, TYPE).

The bicolorous leaves with strongly reflexed apices and slightly curved midribs, together with the short inflorescences, allow this species to be readily recognized. The leaf-apex is curved downward and most of the leaves are folded when pressed. This character is also present in *E. affine*. All other species of *Emmotum* examined have arcuate veins with the ends free, while *E. conjunctum* has the numerous veins straight, pinnate, parallel

but slightly arcuate near the margin, and noticeably anastomosing. The flower-parts are slightly larger and more pubescent than in other species. The style is essentially terminal in the flowers seen.

The closest relationship of this species is probably with *E. fulvum*, from the vicinity of Mt. Roraima.

11. **Emmotum fagifolium** Desv. ex Hamilton, Prod. Fl. Ind. Occ. 29. 1825; Miers, Ann. Mag. Nat. Hist. II. **10:** 179. 1852, Contrib. Bot. **1:** 109. 1851–61; Engler in Mart. Fl. Bras. **12**(2)**:** 45. 1872; Le Cointe, Arvores e Plantas Uteis, 457. 1934. *Pogopetalum acutum* Benth. Lond. Jour. Bot. **2:** 377. 1843; Miers, Ann. Mag. Nat. Hist. II. **10:** 176. 1852.

Trees, the branches terete, brown-tomentose to short-brown-sericeous, becoming glabrate; petioles 1–1.5 cm. long, puberulent, becoming glabrate, sulcate above; lamina lanceolate-oblong to elliptic or rarely ovate-oblong, 9–18 cm. long, 4–8 cm. broad, tomentose above, becoming glabrate, frequently shining, concolorous, brown-sericeous or tomentose, and becoming glabrate below, the midrib sulcate above and prominent below, the veins 9–11 pairs, slightly sulcate above, prominent below, tomentose or long-sericeous, arcuate and free at the ends, the apex abruptly acute, rarely acuminate, extending to a mucronate point 1–1.5 cm. long, the base rounded or subtruncate, the margin slightly revolute; panicles much shorter than the petioles, white-sericeous; calyx campanulate, 2 mm. in diameter, 1–1.5 mm. high, short-white-sericeous, the lobes triangular, usually obtuse at the apex; petals lanceolate-oblong, 4.5–6 mm. long, 1–1.4 mm. broad, densely sericeous outside, lanate inside; stamens 4.5–6 mm. long, the anthers oblong or ovate-oblong, 1–1.2 mm. long, the thecae flat, equally separate at the base and the apex or slightly cordate at the base; pistil symmetrical, 4.5–6 mm. long, the ovary globose, 1–1.5 mm. in diameter at anthesis, hirsute above, with a differentiated glabrous area at the base, the style glabrous, 2–4.5 mm. long, the apex rounded, rarely 3-lobed; fruit unknown.

TYPE LOCALITY: "Guyana" (Hamilton).

ILLUSTRATIONS: Miers, Contrib. Bot. **1:** *t. 21.* 1851–61; Baillon, Hist. Pl. **5:** 278. 1874; Baillon, Adansonia **2:** *t. 9.* 1862, as *Pogopetalum acutum.*

FRENCH GUIANA. *Leprieur 264* (FM); *Martin* ex Hook. Herb. (G). BRITISH GUIANA. Mazaruni, *Sandwith 1547* (NY, US); Demerara River, *Jenman 4867* (NY), *6280* (NY); Demerara River, *Schomburgk s.n.* (C); Barima River, *La Cruz 3375* (C, FM, G, NY, US); Mouth of Kako river, upper Mazaruni, *Pinkus 193* (NY). BRAZIL. Pará: Peixeboi, *Sigueira 9652* (US); Pará, *Ducke 15696* (US), *15805* (US). Maranhão: *Snethlage 341* (FM).

VERNACULAR NAMES: *Bois d'Agouti, harrire n. 'abading, muirachimbé, muira-ximbé, pao de ramo.*

Miers refers to the glabrous base of the ovary as an "adnate cup-shaped disk"; however, the tissue forming this sterile area, although differentiated from the rest of the ovarian wall, is not free as in *Mappia* and is a portion of the pistil. I do not believe this should be called a disk.

The pubescence of the ovary is reduced in amount in several specimens I have seen. In the collections by Martin and Sandwith only a dense ring of hairs remains around the base of the style, the rest of the ovary being glabrous.

12. **Emmotum fulvum** sp. nov.

Arbor; ramis teretibus dense et crispe cinereo-pilosis aut hirsutis; petiolis angulatis 1.5 cm. longis crassis late sulcatis dense hirsutis; laminis ellipticis, 10–14 cm. longis, 4.5–6 cm. latis, supra glabris nitidis nervo medio sulcato hirsuto notatis, subtus dense pilosis aut hirsutis nervum medium prominentem et nervos laterales 7 prominentes arcuatos ad apicem liberos gerentibus, apice acutis mucronatis, basi rotundatis, margine revolutis; paniculis 1–1.5 cm. longis dense fulvo-pilosis aut tomentosis; calyce campanulato, 2 mm. diametro, 2 mm. alto, dense fulvo-piloso, lobis ovatis acutis 1 mm. longis; petalis ovato-lanceolatis, 5.8–6.1 mm. longis, 1–1.2 mm. latis, extus dense fulvo-pilosis, intus fusco-lanatis; staminibus 5–5.3 mm. longis, antheris oblongis 1–1.3 mm. longis, thecis planis; ovario globoso 2 mm. diametro dense fulvo- vel argenteo-hirsuto; stylo subterminali glabro 3–3.4 mm. longo; fructu drupaceo submaturo globoso 1 cm. diametro sparse hirsuto, sarcocarpio 1 mm. crasso, endocarpio osseo 1-loculato, semine in quoque loculo solitario.

ILLUSTRATION: Plate 4.

VENEZUELA. Amazonas: Arabupu, vicinity of Mt. Roraima, alt. 4200 ft., Dec. 21, 1938, *Pinkus 87* (FM ISOTYPE, NY TYPE).

Pinkus reports this plant to be a tree 36 feet high, with a trunk diameter of 8 inches. The calyx and corolla are covered with a yellow-brown pubescence and the anthers and pistil are said to be white. It occurs in mixed forests on clay soil.

This species is near *E. fagifolium* and *E. conjunctum*. It differs from both of these and is characterized by having a dense yellow-brown pubescence on the perianth-parts as well as on the axis and bracts of the inflorescence, and by lacking the conspicuous sterile fleshy base to the pistil.

SPECIES EXCLUDED

EMMOTUM APOGON Griseb. Abhandl. Ges. Wiss. Goetting. **24:** 149. 1879 = **Citronella apogon** (Griseb.) Howard.

EXPLANATION OF PLATES

PLATE I

Emmotum nudum Howard (*Ducke 11367*)

Fig. 1. Habit, × ½; 2. Glabrous pistil with a basal ring of differentiated sterile tissue, × 10; 3–5. Lateral, abaxial, and adaxial views of the stamens with dithecal anthers, × 10; 6. Pubescent calyx, × 10; 7. Side view of a mature drupe, × 1; 8. Basal view of a mature drupe showing the lobed margin and the minute persistent calyx, × 1; 9. Diagrammatic cross-section of the ovary showing the three eccentric locules with two ovules in each locule, × 15; 10. Abaxial view of the petal taken from a mature bud, × 12; 11. Lateral view of a petal showing the lanate pubescence on the raised midrib, × 9; 12. Adaxial view of a petal after anthesis, × 9.

PLATE II

Emmotum floribundum Howard (*Klug 1212*)

Fig. 1. Habit, × ½; 2, 3. Adaxial and lateral views of petals after anthesis, × 8; 4. Glabrous pistil, × 12; 5–7. Lateral, abaxial, and adaxial views of stamens, × 10. Fig. 7 shows the longitudinal dehiscence of the anther-sacs along the junction with the connective.

PLATE III

Emmotum conjunctum Howard (*Tate 1354*)

Fig. 1. Habit, × ½; 2, 3. Adaxial and lateral views of petals after anthesis, × 7; 4. Pistil showing the hirsute ovary, the differentiated glabrous basal sterile ring of tissue, and the glabrous style, × 10; 5. Calyx, × 7; 6–8. Lateral, abaxial, and adaxial views of the stamens, × 9.

PLATE IV

Emmotum fulvum Howard (*Pinkus 87*)

Fig. 1. Habit, × ½; 2. Pistil showing the hirsute ovary with an undifferentiated base, × 12; 3, 4. Adaxial and lateral views of a stamen, × 9; 5. Pedicel and calyx showing the floral articulation immediately subtending the calyx and the bracts on the pedicel, × 7; 6, 7. Diagrammatic cross and longitudinal sections of the ovary showing the three eccentric locules, each with two anatropous ovules pendent from near the apex, × 10.

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